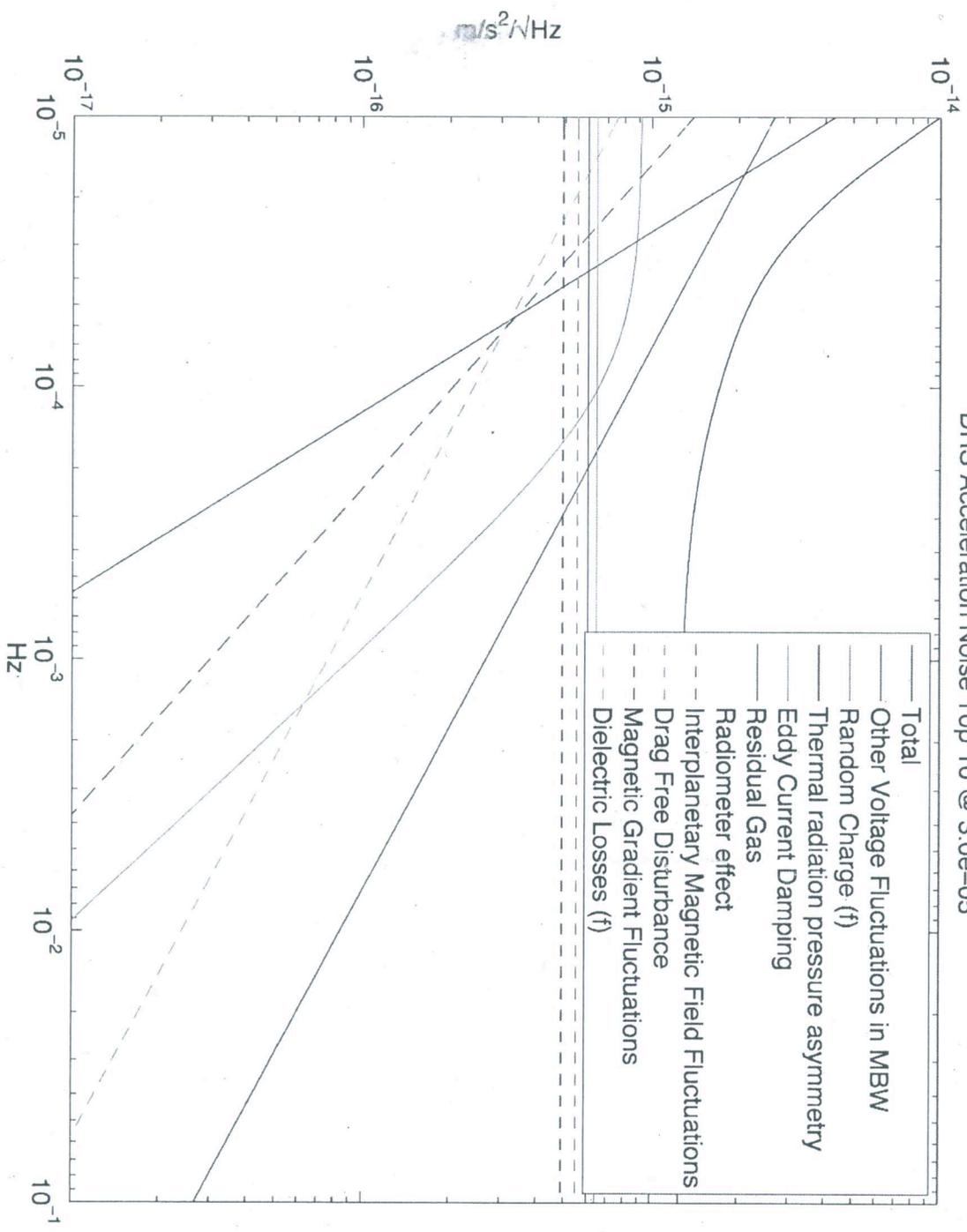


Beyond Einstein: From the Big Bang to Black Holes

# Top 10 at 3e-5 Hz



DRS Acceleration Noise Top 10 @ 3.0e-05



# 5 System Baseline

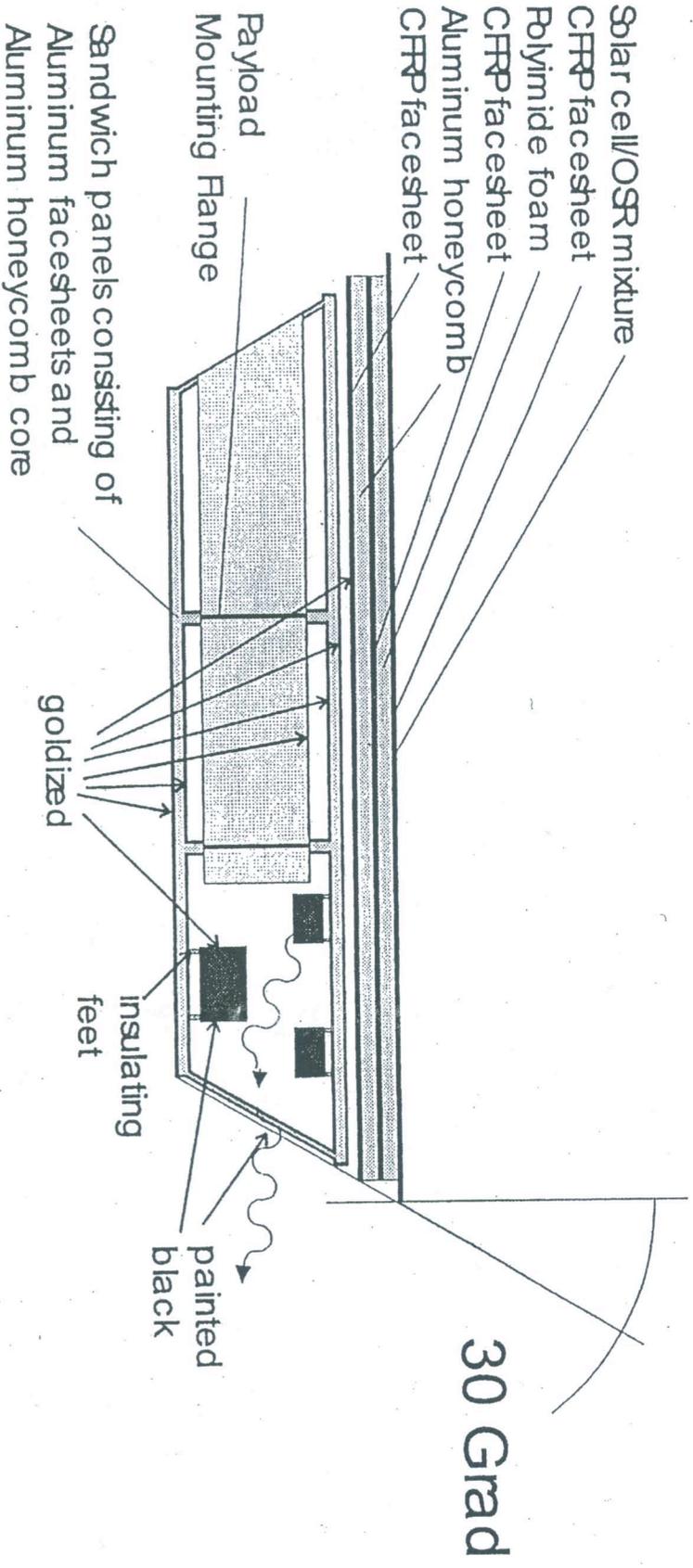
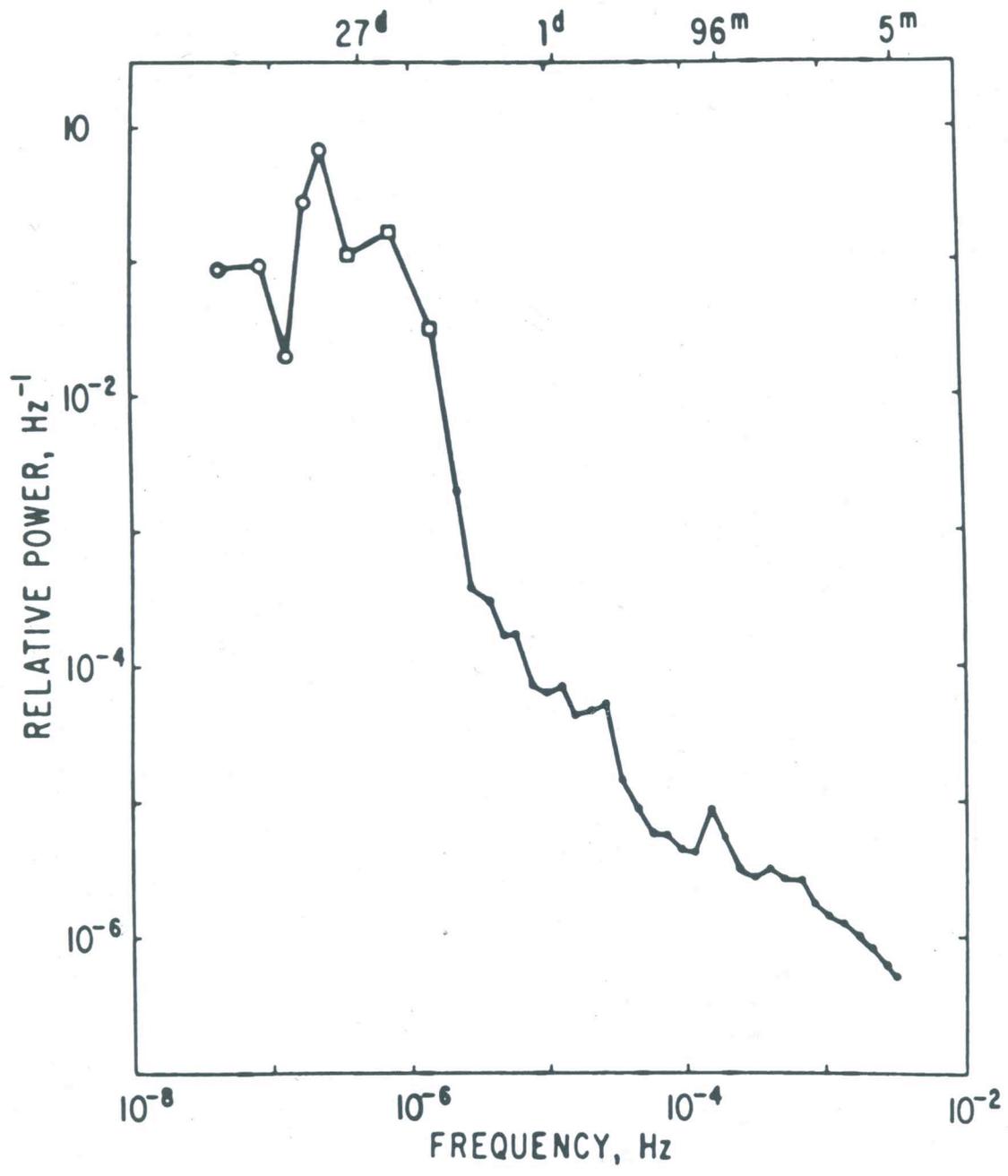


Figure 5.2-18: Thermal design principle



**Table 6.2-15: Case 2 Solar Constant Fluctuation Results**

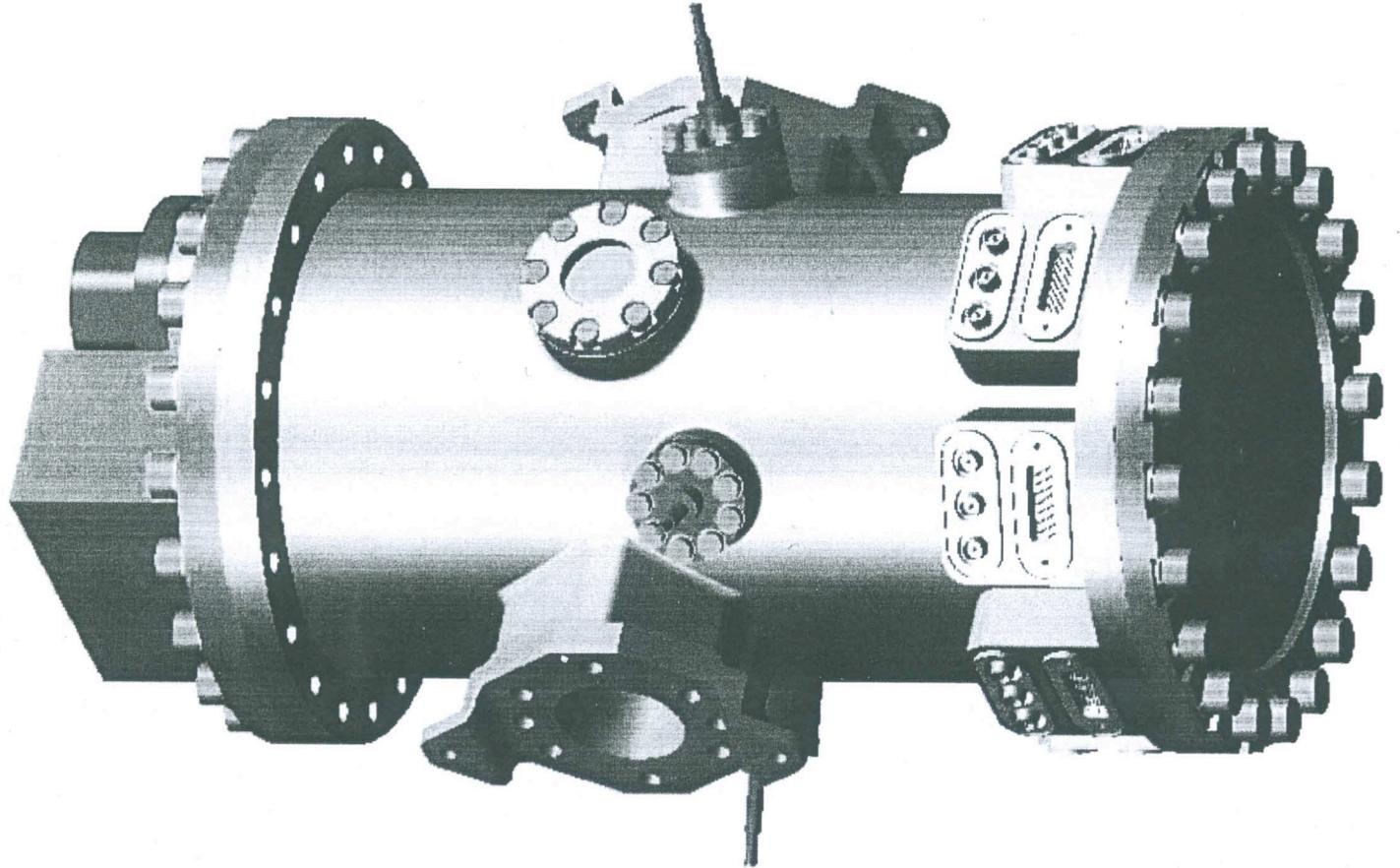
Case 2: $10^{-3}$ Hz, 0.13 %						
Component	Pre-Phase A		Phase A			
	Temperature Response [K]/[Hz] <sup>1/2</sup>	Ratio to 1E-06 [K]/[Hz] <sup>1/2</sup>	Semi- Amplitude [K]	Transfer Function [K]/[W/m <sup>2</sup> ]	Temp. Response [K]/[Hz] <sup>1/2</sup>	Ratio to 1E-06 [K]/[Hz] <sup>1/2</sup>
Optical Bench	4.3E-07	0.43	3.8E-11	2.4E-11	3.8E-11	3.8E-05
Primary Mirror	4.5E-08	0.045	3.5E-11	2.2E-11	3.5E-11	3.5E-05
P/L E-Boxes	3.4E-05	N/A	3.5E-11	2.2E-11	3.5E-11	N/A

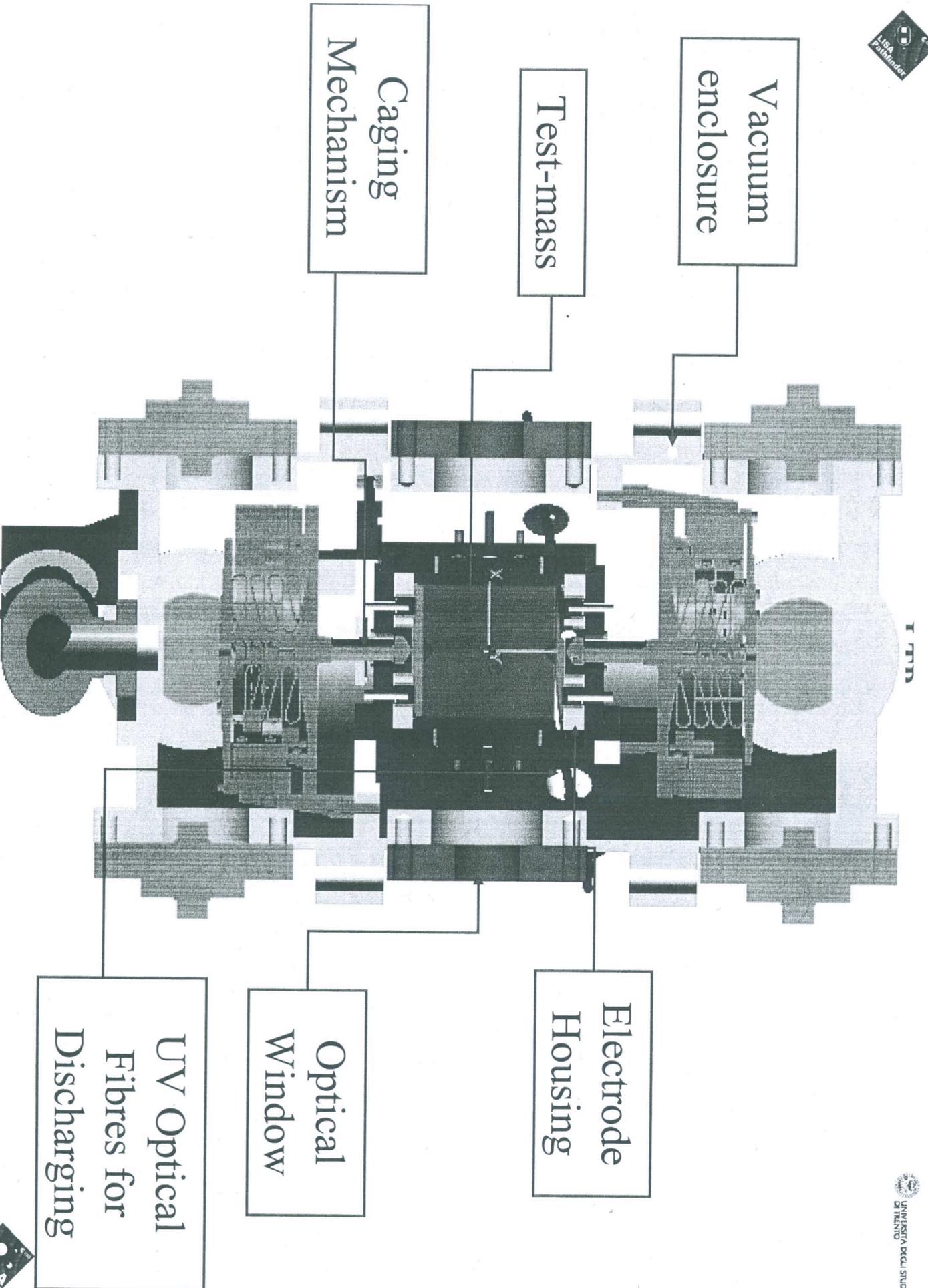
**Table 6.2-16: Case 3 Solar Constant Fluctuation Results**

Case 3: $10^{-4}$ Hz, 0.3 %						
Component	Pre-Phase A		Phase A			
	Temperature Response [K]/[Hz] <sup>1/2</sup>	Ratio to 1E-06 [K]/[Hz] <sup>1/2</sup>	Semi- Amplitude [K]	Transfer Function [K]/[W/m <sup>2</sup> ]	Temp. Response [K]/[Hz] <sup>1/2</sup>	Ratio to 1E-06 [K]/[Hz] <sup>1/2</sup>
Optical Bench	9.9E-05	99	1.1E-06	3.1E-07	1.1E-06	1.1
Primary Mirror	1.2E-05	12	9.9E-07	2.8E-07	9.9E-07	1.0
P/L E-Boxes	4.8E-03	N/A	2.2E-05	6.3E-06	2.2E-05	N/A

Table 1. Calculated fluctuations of the optical bench temperature.

Frequency (Hz)	$3 \times 10^{-5}$	$1 \times 10^{-5}$	$3 \times 10^{-6}$
Solar irradiance fluctuations (% $\text{Hz}^{-\frac{1}{2}}$ )	0.54	1.0	1.9
Solar panel surface temperature spectral amplitude ( $\text{K Hz}^{-\frac{1}{2}}$ )	0.50	0.9	1.8
Optical bench temperature spectral amplitude ( $\text{K Hz}^{-\frac{1}{2}}$ )	0.00026	0.012	0.13





TEMPERATURE VARIATIONS FOR LISA GRS  
 ( $10^{-3} \text{ K}/\sqrt{\text{Hz}}$ )

FREQUENCY (mHz)	0.01	0.03	0.10
RAL MODEL	12	0.26	0.0012
LISA LITE MODEL		2.0	0.09
LISA LITE (ESTIMATED)	30		
ESTIMATED TEMP. DIFF. ACROSS HOUSING ( $\times 1/30$ ASSUMED)	1.0	0.07	0.003
$10^{-5} \left( \frac{0.1 \text{ mHz}}{f} \right)^{1.5} \text{ K}/\sqrt{\text{Hz}}$	0.32	0.061	0.010

## ASSUMPTIONS FOR SUGGESTED MODIFIED GRS ERROR ESTIMATES

1. Proof mass charge controlled with knee in curve at  $1 \times 10^{-4}$  Hz
2. Temperature variation of GRS mainly due to solar intensity variation at 0.1 mHz and lower frequencies
3. Variations of temperature difference across GRS housing are a factor 30 less than those of the GRS
4. Variations of temperature difference across GRS housing are approximated by  $1 \times 10^{-5} \left( \frac{0.1 \text{ mHz}}{f} \right)^{1.5} K / \sqrt{\text{Hz}}$
5. Voltage fluctuation noise is based on assumption of  $0.5 \times 10^{-4} \left( \frac{0.1 \text{ mHz}}{f} \right)^{0.5} V / \sqrt{\text{Hz}}$  variations
6. Activation temperature for fluctuating asymmetric outgassing is 7,500 K

SUGGESTED MODIFIED GRS ERROR ESTIMATES  
 ( $10^{-15} \text{ m/s}^2/\sqrt{\text{Hz}}$ )

FREQUENCY (mHz)	0.01	0.03	0.10
RADIATION PRESSURE	4.4	0.84	0.14
RADIOMETER EFFECT	1.4	0.28	0.04
FLUCT. ASYM. OUTGAS.	1.4	0.30	0.04
RANDOM CHARGE	0.90	0.88	0.65
VOLTAGE FLUCT.	1.3	0.77	0.42
INTERPLAN. MAG. FIELD	1.4	0.56	0.20
DIELECTRIC LOSSES	0.8	0.46	0.25
OTHER	1.4	1.4	1.4
COMBINED ERROR	1.7	2.4	1.7
$1.95 \times 10^{-15} \left( \frac{0.1 \text{ mHz}}{f} \right)^{0.5}$ m/s <sup>2</sup> /√Hz	6.16	3.56	1.95

# Strain Amplitudes During Last Year Before MBH-MBH Coalescence

